CLAIMS

What is claimed is:

1. A turbine engine component comprising:

    a superalloy substrate;

    a bond coat on the superalloy substrate having a thickness in the range of about 0.0005 inch to about 0.005 inch;

    an alumina scale overlying the bond coat; and

    a thermal barrier coating overlying the alumina scale having a thickness in the range of about 0.0025 inch to about 0.010 inch, comprising at least mischmetal oxides.

2. The turbine engine component of claim 1, wherein the thermal barrier coating also comprises another oxide material selected from the group consisting of yttria-stablized zirconia, zirconia, yttria, hafnia, at least one other rare earth oxide, and combinations thereof.

3. The turbine engine component of claim 2, wherein the oxide material is yttria-stabilized zirconia and wherein the percentage of yttria in the yttria-stabilized zirconia is in the range of 4% to 8% yttria by weight.

4. The turbine engine component of claim 3, wherein the oxide material is yttria-stabilized zirconia, wherein the percentage of yttria is about 7% yttria by weight, and wherein the thermal barrier coating comprises, based on 100% of weight, up to about 20% ceria by weight, up to about 30% lanthanum oxide by weight, up to about 7% praseodymium oxide by weight, up to about 20 percent neodymium oxide by weight, and balance yttria-stabilized zirconia.

5. The turbine engine component of claim 2, wherein the thermal barrier coating does not contain any yttria-stabilized zirconia.

6. The turbine engine component of claim 3, wherein the thermal barrier coating comprises, based on 100% of weight, up to about 20% ceria by weight, up to about 30% lanthanum oxide by weight, up to about 7% praseodymium oxide by

weight, up to about 20 percent neodymium oxide by weight, and balance yttria-stabilized zirconia.

7. The turbine engine component of claim 1, wherein the thermal barrier coating comprises a bottom layer, a middle layer overlying the bottom layer, and a top layer overlying the middle layer.

8. The turbine engine component of claim 7, wherein the bottom layer is 7% YSZ, the middle layer is mischmetal oxide, and the top layer is 7% YSZ.

9. A method for the application of a thermal barrier coating to a superalloy turbine engine component comprising the steps of:

    providing an electron beam physical vapor deposition apparatus;

    providing a turbine engine component comprising a surface to be coated;

    providing a first mischmetal ingot;

    providing an second oxide ingot comprising an oxide material selected from the group consisting of yttria-stablized zirconia, zirconia, yttria, hafnia, at least one other rare earth oxide, and combinations thereof;

    placing the component and the ingots into the apparatus;

    forming melt pools on the ingots;

    drawing oxygen into the apparatus and oxidizing the mischmetal;

    dispersing mischmetal oxide vapors and other oxide vapors;

    depositing the mischmetal oxide vapors and the other oxide vapors onto the surface to be coated, said deposition forming a thermal barrier coating having a thickness in the range of about 0.0025 inch to about 0.010 inch.

10. The method of claim 9, wherein the mischmetal oxide vapors and the other oxide vapors are intermittently co-deposited.

11. The method of claim 9, wherein the other oxide is yttria-stabilized zirconia, wherein the yttria composition is in the range of about 4% to about 8% yttria by weight.

12. The turbine engine component of claim 11, wherein the yttria-stabilized zirconia is about 7% yttria by weight, and wherein the thermal barrier coating comprises, based on 100% of weight, up to about 20% ceria by weight, up to about 30% lanthanum oxide by weight, up to about 7% praseodymium oxide by weight, up to about 20 percent neodymium oxide by weight, and balance yttria-stabilized zirconia.

13. A method for the application of a thermal barrier coating to a superalloy turbine engine component comprising the steps of:

    providing an electron beam physical vapor deposition apparatus;

    providing a turbine engine component comprising a surface to be coated;

    providing a first mischmetal oxide ingot;

    providing a second oxide ingot comprising another oxide material selected from the group consisting of yttria-stablized zirconia, zirconia, yttria, hafnia, at least one other rare earth oxide, and combinations thereof;

    placing the component and the ingots into the apparatus;

    drawing a vacuum within the apparatus;

    forming melt pools on the ingots;

    dispersing mischmetal oxide vapors and other oxide vapors;

    depositing the mischmetal oxide vapors and the other oxide vapors onto the surface to be coated, said deposition forming a thermal barrier coating having a thickness in the range of about 0.0025 inch to about 0.010 inch.

14. The method of claim 13, wherein the mischmetal oxide vapors and the other oxide vapors are intermittently co-deposited.

15. The method of claim 14, wherein the other oxide is yttria-stabilized zirconia, wherein the yttria composition is in the range of about 4% to about 8% yttria by weight.

16. The method of claim 15, wherein the yttria-stabilized zirconia is about 7% yttria by weight, and wherein the thermal barrier coating comprises, based on 100% of weight, up to about 20% ceria by weight, up to about 30% lanthanum oxide by

weight, up to about 7% praseodymium oxide by weight, up to about 20 percent neodymium oxide by weight, and balance yttria-stabilized zirconia.

17. A method for the application of a thermal barrier coating to a superalloy turbine engine component comprising the steps of:

providing an electron beam physical vapor deposition apparatus;

providing a turbine engine component comprising a surface to be coated;

providing a mischmetal oxide ingot;

placing the component and the ingot into the apparatus;

drawing a vacuum within the appartus;

forming melt pools on the ingot;

dispersing mischmetal oxide vapors;

depositing the mischmetal oxide vapors and the yttria-stabilized zirconia vapors onto the surface to be coated, said deposition forming a thermal barrier coating having a thickness in the range of about 0.0025 inch to about 0.010 inch.

18. A method for the application of a thermal barrier coating to a superalloy turbine engine component comprising the steps of:

providing an electron beam physical vapor deposition apparatus;

providing a turbine engine component comprising a surface to be coated;

providing an oxide ingot comprising mischmetal oxide and another oxide material selected from the group consisting of yttria-stablized zirconia, zirconia, yttria, hafnia, at least one other rare earth oxide, and combinations thereof;

placing the component and the ingot into the apparatus;

drawing a vacuum within the apparatus;

forming a melt pool on the ingot;

dispersing mischmetal oxide vapors and yttria-stabilized zirconia vapors;

depositing the mischmetal oxide vapors and the yttria-stabilized zirconia vapors onto the surface to be coated, said deposition forming a thermal barrier coating having a thickness in the range of about 0.0025 inch to about 0.010 inch.

19. The method of claim 18, wherein the oxide ingot is a yttria-stabilized zirconia ingot with a mischmetal oxide insert.

20. The method of claim 19, wherein the yttria-stabilized zirconia is in the range of 4% to 8% yttria by weight.

21. The method of claim 20, wherein the yttria-stabilized zirconia is 7% yttria by weight, and wherein the ingot comprises, based on 100% of weight, up to about 20% ceria by weight, up to about 30% lanthanum oxide by weight, up to about 7% praseodymium oxide by weight, up to about 20 percent neodymium oxide by weight, and balance yttria-stabilized zirconia.

22. The method of claim 18, wherein the oxide ingot is a mischmetal oxide ingot with a yttria-stabilized zirconia insert.

23. The method of claim 22, wherein the yttria-stabilized zirconia is in the range of 4% to 8% yttria by weight.

24. The method of claim 23, wherein the yttria-stabilized zirconia is 7% yttria by weight, and wherein the thermal barrier coating comprises, based on 100% of weight, up to about 20% ceria by weight, up to about 30% lanthanum oxide by weight, up to about 7% praseodymium oxide by weight, up to about 20 percent neodymium oxide by weight, and balance yttria-stabilized zirconia.

25. The method of claim 18, wherein the oxide ingot comprises a mixture of mischmetal oxide powder and another oxide powder.

26. The method of claim 25, wherein the other oxide powder is yttria-stabilized zirconia is in the range of 4% to 8% yttria by weight.

27. The method of claim 26, wherein the yttria-stabilized zirconia is 7% yttria by weight, and wherein the oxide ingot comprises, based on 100% of weight, up to about 20% ceria by weight, up to about 30% lanthanum oxide by weight, up to

about 7% praseodymium oxide by weight, up to about 20 percent neodymium oxide by weight, and balance yttria-stabilized zirconia.